

A Brief Report on the Progress of Pteridological Research in China

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Historical sketch.—Like other branches of botany, serious study of modern pteridology in China was not launched until 1927, when the senior writer decided to switch his interest from Chinese dendrology to pteridophytes. There was then no one in China who knew ferns or how to study ferns. There was no literature available except Engler and Prantl's "Die Natürlichen Pflanzenfamilien" (1898–1902), and there was not a single fern specimen correctly identified in the small herbarium that had just been initiated in Beijing. It seemed unimaginable to start studying ferns under such hopeless circumstances. It was his strong will that surmounted all the difficulties he met with at the beginning. For literature, for example, he wrote to the then world authorities on ferns, such as H. Christ, C. Christensen, W. R. Maxon, and E. B. Copeland, asking for reprints of their papers and monographs on ferns. Thanks to their generous help, he obtained within a few years practically all the available literature chiefly concerning Asiatic ferns of that time to start his work with.

After a few years of preparation, including extensive fern collecting particularly in the fern-rich provinces south of the Yangtze River and making preliminary identifications by consulting the literature then available, he soon realized that type specimens are the key to plant taxonomy. The status of any taxon must be decided by its type specimen, not by its description. Therefore, he decided to visit Europe in the early spring of 1930. He went first to Copenhagen where, under the direction of Dr. Carl Christensen, with whom he had had contact by previous correspondence, he began seriously to carry out a study of Chinese ferns. Both Christensen and he participated in the Fifth International Botanical Congress at Cambridge, England in the fall. At the Congress, he met in person with great joy all of the then leading pteridologists from the United States, Germany, England, and other countries. After the Congress, he stayed at Kew for over a year, mostly working on Chinese and Himalayan ferns and taking photographs of type specimens, as well as making critical notes on the types. Afterwards he went back to Copenhagen and stayed there for some months to discuss problems with Christensen concerning the classification of ferns in general and the guiding principles of classification in particular. Leaving Copenhagen in the early spring of 1932, he proceeded to visit most other leading European herbaria as far away as Vienna and Prague, looking up type specimens of ferns and taking photographs. After he returned from Europe in the fall of 1932, he joined the Fan Memorial Institute of Biology in Peiping and devoted himself with great zeal to the cause of Chinese fern study. During the period of the Japanese invasion of China, he evacuated to Yunnan, collecting and studying the rich fern

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flora there. After liberation in 1949, he was transferred to the Institute of Botany, Academia Sinica, Beijing, as head of the Taxonomic Section, where he has continued his fern studies until now.

Fern hunting in China.—In 1911, the British fleet surgeon Dr. C. G. Matthew published in the Journal of the Linnaean Society of London an "Enumeration of Chinese ferns" totalling a little over 1,000 species then known in China, of which a considerable number have subsequently been reduced as synonyms of earlier-described taxa.

Today, after seventy years have elapsed, the species of ferns and fern-allies known in China have been estimated at roughly 2,200 species, about doubling Matthew's enumeration. Yet this is far from the final figure for the Chinese fern flora. In the spring of last year, for example, the senior writer had a chance to identify four fern collections from different parts of China and found the number of new species is still mounting. In a collection made by the Sino-American Joint Botanical Expedition to Western Hupeh, in central China, 13 new species of ferns were found in five weeks time, including one extraordinary *Matteuccia*. From another collection made in southwestern Yunnan, nine new species have been identified, one a species of *Platycerium*, a genus first recorded from China in the evergreen rain forest in the border of Upper Burma. In a third, small collection from northeastern China (formerly known as Manchuria), at least two species are new, one of them a *Phyllitis*, a genus never known in China before. Five new species were recognized from a collection made in Chekiang province along the eastern coast of China. From these instances, one will certainly be amazed at the extraordinary richness of the Chinese fern flora. In our estimate, by the end of the third decade of the twenty-first century, the number of Chinese ferns will most likely have increased by at least three to four hundred more species. This is simply because of the vast expanse of China's extremely rugged topography and diversified ecology. The richness of her flora in many provinces never can be exhaustively explored by only a few visits. The famous sacred Mount Omei in Szechuan, for example, has been visited by at least 60 botanists, both foreign and Chinese, since 1883; yet just last year three more new ferns were discovered by the cytotaxonomical team of the Institute of Botany, Academia Sinica. Consequently, fern hunting in China is still a most rewarding adventure. One can easily collect 20–40 different specimens in a day, depending upon the locality one may visit. An exactly similar situation exists with China's phanerogam flora.

Fern herbaria.—As pointed out above, prior to 1927 there were no fern herbaria in China, and in fact only very few specimens had been collected. Strange to say, before 1927 the senior writer had collected thousands of herbarium specimens of flowering plants in different provinces, but very few ferns, in which he then had no interest. Through the effort of many botanists and collectors all over China during the last 50 years or so, the fern herbarium at the Institute of Botany, Beijing, has grown quickly and now has in excess of 150,000 numbers, of which about 95% are of Chinese origin. It is already in a position to serve as a working herbarium for the study of Chinese ferns. In addition to the herbarium specimens, there are kept over 1,000 photographs of types and isotypes of ferns taken during the senior writer's

tour in Europe. There is now little difficulty in identifying Chinese fern collections in the herbarium.

All other affiliated botanical institutions of the Academia Sinica and most universities in different provinces or regions also have a herbarium of local ferns and fern-allies for compiling local Floras and for research use. Nevertheless, local herbaria still have a long way to go as far as the sufficiency of their collecting activities. At present, even many botanically rich areas within their reach still remain little explored. As a matter of fact, their first and foremost task should be to launch extensive botanical explorations in their respective provinces or regions for many years to come.

To meet the urgent need of housing a steady influx of specimens from all parts of the country, a new, modern, 6-storied National Herbarium is under construction and will be completed by the end of 1982. The herbarium of the Institute of Botany will be removed from the Beijing Zoo to its new site in the Botanical Garden, Beijing.

Fern research.—In the past 55 years, a considerable amount of research on pteridophytes has been carried out in China, with fern taxonomy the chief activity. Many short papers, monographs, iconographies, and some fern Floras have been published. With over 2,000 species of ferns and fern-allies, the study of Chinese pteridophytes is no mean task, and taxonomic study will continue to be an important aspect of pteridological research in China for many years to come. However, for the purpose of enhancing the scientific level of taxonomic studies, other aspects of the biology of ferns should also be studied. In the past 23 years, a great amount of work on fern spores has been conducted. As a result, a monograph on spore morphology of Chinese ferns, "Sporae Pteridophytorum Sinicorum," was published in 1976. It is a 414-page volume dealing with 52 families, 174 genera, and over 1,000 species of Chinese pteridophytes. It includes numerous drawings and photographs, a chapter on the geography of Chinese ferns, and another on fossil spores in different geological times.

Preparation was made as early as 1964 for the cytotaxonomical study of Chinese ferns, when about 300 species of ferns had been introduced into cultivation in the Beijing Botanical Garden. In the following years, work on chromosome counts was launched successfully. Unfortunately, the entire work was frustrated by the so-called "cultural revolution," and 300 well grown potted ferns were thrown out of the greenhouse in the winter of 1966. However, with the visit of Mr. A. C. Jermy to China in the fall of 1978 and the lectures he gave on the biosystematic study of *Dryopteris*, the interest in cytotaxonomy in China was promptly renewed. Studies on chromosomes are being carried out at several institutions at present.

Fern Flora of China.—There will be five volumes of the "Fern Flora of China" as part of the 80-volume "General Flora of China." The first volume was published in October, 1959. Two other volumes were ready for printing, but, alas, this, too, was frustrated by the "cultural revolution" for a time. The remaining two volumes are now in preparation. It is hoped that the first edition of the "Fern Flora of China" will all be published shortly after 1985. Other fern Floras published up to now are the "Fern Flora of Hainan, vol. 1" (1964), "Flora Tsinlingensis, Pteridophyta, vol. 2" (1974), "Herbaceous Flora of Northeastern China, vol. 1" (1959), and the "Flora of

Jiangsu Province, vol. 1 (Pteridophyta)." The "Fern Flora of Tibet" was scheduled for publication about the end of 1981 as part of the "Flora of Tibet." Several local fern Floras are in preparation, including those for the provinces of Szechuan, Fukien, and Yunnan, each with 400–1,000 species. It is a strenuous task for local botanists to complete their respective fern Floras. It has been planned that each Chinese province or region will eventually have its own Flora with the pteridophyta as a component.

To coordinate and promote fern studies all over the country, the Botanical Society of China in the fall of 1979 set up a section of Chinese Pteridology as an affiliated organ. At the inaugural meeting held in October, 1979 at Tian Mo Shan, Chekiang province, the senior writer was elected president of the section. A plan for developing and popularizing fern study in China was formulated at this meeting.

Fern systematics.—Since 1940, the classification scheme pteridophytes has attracted the attention of many fern students and has undergone great changes. Up to now, there have evolved at least 11 different systems by different authors, of which the first breakthrough was "On natural classification of the family 'Polypodiaceae'" by the senior writer (*Sunyatsenia* 5:201–270, 1940), which was soon followed by Copeland's and Holttum's classifications. In 1954, the senior writer put forth a paper titled "Systematic arrangements of families and genera of Chinese pteridophytes with corresponding names in Chinese" (*Acta Phytotax. Sinica* 3:93–99). In 1978, he published a treatise on "The Chinese fern families and genera: Systematic arrangement and historical origin" (*Acta Phytotax. Sinica* 16(3):1–19, 16(4):16–37, 1978). In spite of all the defects of one kind or another in these systems, we may well say that the phylogenetic study of ferns has made decidedly marked progress in the last 40 years over the Hookerian and Dielsian systems with which we are all familiar. It may be presumed that to most fern students the interrelationships of fern families and genera as a whole are now self-evident, although a few taxa still remain uncertain as to their proper systematic position, as indicated in the latest classification scheme by the senior writer. It may be that many of these isolated ferns are survivors from ancient times whose ancestors or relatives are no longer in existence today, nor are their fossil records available so far. In systematic treatments, we prefer to keep these taxa isolated as such, rather than to combine them with apparently not closely related families. This is of course entirely a matter of personal taste. Regarding this and other problems of fern systematics, the late, revered Carl Christensen had liberal views, but his rather early death prevented him from putting all these down in his writings.